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GB 2148011 A GB 2088063 A US 3911215 A

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(54) Touch panel

(57) A touch panel with improved resistance to problems of cracking in an upper, resistive layer is made by substituting a phototransparent organic film 7 for the conventional resistive layer. As described the film 7 is formed of metal oxide powder in a polymer and has a resistivity of about 300-800 ohms/square. The panel has a transparent substrate 1 carrying a conductive layer 2, e.g. of indium tin oxide, a spacing layer 3, and the organic resistive film 7. The latter may be covered by a protective film structure (Fig. 4). The panel is stated to have an economic advantage in that it can be used perpetually if the conductive film in the lower part is not impaired.

FIG. 3

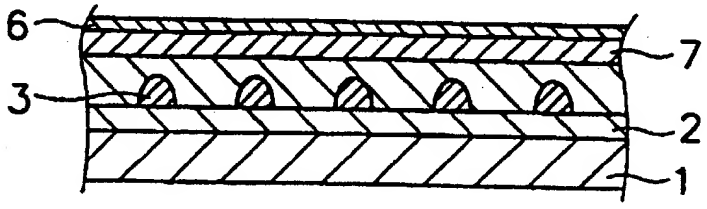

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FIG. 1

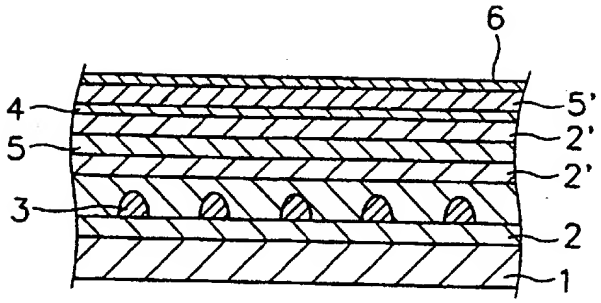


FIG. 2

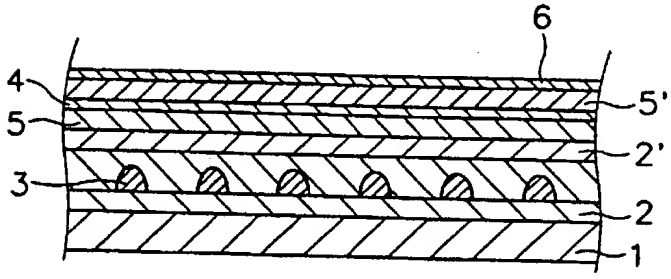


FIG. 3

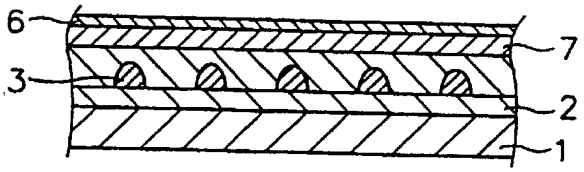
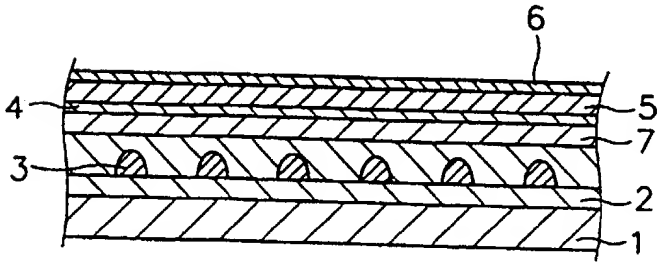


FIG. 4



TOUCH PANEL

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This invention relates to a touch panel, more particularly, to a touch panel in which the contact conductive layer is substituted with phototransparent organic conductive films to give conductivity per se, thus not requiring coating process of conductive layer and resolving problems of crack owing to the conductive layer.

A touch input system including a touch panel which determines the position of an object which is in contact with a contact surface, has been used variously in the fields of computer graphics, design and manufacturing systems using computers. The touch system denotes a system consisting of a digitizer which responds to a touch on a distinctive position of a contact surface, and can be driven by touching with a finger of an operator because of a transparent covering layer on a conductive surface.

The driving principle of a touch panel in the touch panel system is as follows:

A contact surface of a touch panel has equal specific electric resistance and is connected to an

electrode made of a material of which conductivity is greater than that of the contact surface. This touch input system consists of means which applies an electric potential across a contact surface in the direction 2 or the direction vertical to the direction 1 after an electric potential across a contact surface in the direction 1 is applied. Consequently, if the contact is touched by a finger of an operator or an object such as a touch pen, an electric potential of the touched position is measured which corresponds to a distance between positions of the objects on contact surface as well as a distance between an electrode and an object. The system consists of means not only providing x-y coordinates but also determining and providing z axis value on the basis of parameters of pressure or position. And dot space plays a role of wrapper for double film and dot space tip in the dot spaces damages conductive layer (2') easily by being applied on the conductive layer (2') heavily to induce crack of conductive layer, which is caused by the formation of wrapper and the sharpness of a tip. Therefore by blunting the formation of wrapper and the sharpness of the tip using cushion of an adhesive, some problems of crack are solved, but there still remain the problems that blunt space tip is difficult to make and there are no essential countermeasures for crack on the conductive layer. To solve the

problems, the structure of touch panel double film in FIGs. 1 and 2 is used. The structure consists of the conductive layers formed on the upper part of the base substrate and on the lower part of double film which are separated by insulated dot space (3), and the lower film coated with the upper film (5') on both sides thereof, and hardcoating layer thereon.

The touch panel with this structure is operated according to a principle that coordinate values are recognized using positional change of resistance values when substrate conductive layer (2) of the base substrate and contact conductive layer (2') of film are attached by touching with a touch pen. In general, glass, plastics or various printer circuit substrate materials, or rigid body such as a metal with insulated layer are used as the base substrate (1) and hard plate coated with plastics material in the form of soft layer thereon, as well.

And conductive layers (2, 2') consist of a transparent conductive material for which typically indium tin oxide (ITO) is used. Polyester group resins such as polyethylene terephtalate (PET) and polycarbonate are used as the films (5, 5').

FIG. 1 indicates the structure with conductive layers coated on both sides of the lower film (5) and FIG. 2 indicates the structure in which only the substrate conductive layer (2) of the upper part of the base substrate and the conductive layer attached

thereto are used by coating only one side of the lower film (5).

Generally, the film of a thickness of about 25 μm is used as the lower film, and the thickness of the conductive layer can be adjusted to about 100 Å as a conductive layer having the resistance of 300 Ω/□ is used.

The crack is solved to some degree using the double film structure in FIGs. 1 and 2. However, the problems still remain because the crack of conductive layer is eventually generated to make an error in operation by changing the value of resistance, and particular countermeasures therefor have not been developed so far.

The object of the present invention is to resolve problems induced with coating of conductive layers by providing a touch panel in which the film coated with a conductive layer is substituted with the phototransparent organic conductive film.

To achieve the object of the present invention, provided is a touch panel comprising a substrate (1) made of a transparent insulated material, a substrate conductive layer (2) formed on the substrate, a dot space (3) formed between the substrate conductive layer and a contact conductive layer (2′), the contact conductive layer (2′) causing change of

electric resistance by external contact on the dot space, wherein the touch panel is characterized in that the contact conductive layer is consisted of a phototransparent organic conductive film(7).

According to the invention, the contact conductive layer consisted of a phototransparent conductive film can further comprise a customary hardcoating layer on the surface thereof to improve abrasion and friction properties of the phototransparent conductive film (7), as indicated in FIG. 3.

In addition, the contact conductive layer according to the invention can further comprise a phototransparent conductive coating layer (2') on one or both sides of the phototransparent conductive film (7), as indicated in FIG. 4.

Moreover, the contact conductive layer according to the invention in FIG. 4 further comprises a protective film layer (5) such as polyester film thereon.

According to the invention, the phototransparent organic conductive film can be simply manufactured by the method that white powder of metal oxides consisting of indium oxide, antimony oxide, tin oxide, etc. are added to an ordinary polymer for the formation of films to have 300 - 800 Ω/□ of resistance value of the mixed polymer.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 and FIG. 2 are cross-sectional views of the conventional double film touch panels.

FIG. 3 is a cross-sectional view of the touch panel according to example 1 of the present invention.

FIG. 4 is a cross-sectional view of the touch panel according to example 2 of the present invention.

The following is presented as an example but does not limit the scope of the invention.

Example 1

ITO was coated on a transparent insulated substrate by chemical vapour deposition method indicated in FIG. 3 to form a transparent conductive layer, dot spacer of insulated material was formed thereon, and a thin phototransparent organic conductive film was hardcoated thereon to manufacture a touch panel.

Example 2

A touch panel was manufactured as the same process of example 1 except that one more layer of film is attached onto the thin phototransparent organic conductive film by an adhesive indicated in FIG. 4.

Example 3

A touch panel was manufactured as the same process of example 2 except that ITO was coated on

both sides of the thin phototransparent organic conductive film.

To evaluate the quality of the touch panels manufactured in the above examples 1 to 3, the resistance property of transparent conductive layer of the touch panels was measured. The result was indicated in the following table:

Table

	resistance property improvement percentage
Example 1	100
Example 2	100
Example 3	95

As shown in the above table, the resistance property of the touch panel according to the present invention was improved almost completely in comparison with the touch panels with the double film structure indicated in FIGs. 1 and 2 of the conventional method and the problems of the resistance change for crack were solved. In general,

because resistance of phototransparent organic conductive film of 300 Ω/□, which is the resistance required for a touch panel, was difficult to obtain (over 80 %) taking into consideration of phototransmittance, the transparent conductive layers are coated thereon. More efficient structure of the touch panel is when phototransmittance and resistance value of phototransparent organic conductive film is about 300 - 800 Ω/□. Moreover, the touch panel has economic advantage because it is capable of being used permanently if a phototransparent organic conductive film is not damaged.

CLAIMS

1. A touch panel comprising:

a substrate made of a transparent insulated material;

a substrate conductive layer formed on said substrate;

a dot space formed between said substrate conductive layer and a contact conductive layer; and

a contact conductive layer causing change of electric resistance by external contact on said dot space.

2. The touch panel of claim 1, wherein said contact conductive layer consists of a phototransparent organic conductive film.

3. The touch panel of claim 2, wherein said contact conductive layer further comprises a phototransparent conductive coating layer on one or both sides of the phototransparent organic conductive film.

4. The touch panel of claim 2, wherein said contact conductive layer further comprises a protective film layer on said phototransparent organic conductive film.

5. The touch panel of any one of claim 1 to claim 4, wherein said contact conductive layer further comprises a hardcoating layer on the surface thereof.

6. The touch panel of claim 2, wherein said phototransparent organic conductive film is simply manufactured by the method that white powder of metal

oxides consisting of indium oxide, antimony oxide, or tin oxide, etc. are added to an ordinary polymer for the formation of films to have the resistance value of 300 - 800 Ω/□ of the mixed polymer.

7. A touch panel substantially as described herein, with reference to the accompanying drawings.

Amendments to the claims have been filed as follows

1. A touch panel comprising:

a substrate made of a transparent insulated material;

a substrate conductive layer formed on said substrate;

a dot space formed between said substrate conductive layer; and

a contact conductive layer formed on said dot space and causing change of electric resistance by external contact on said dot space, wherein said contact conductive layer consists of a phototransparent organic conductive film.

2. The touch panel of claim 1, wherein said contact conductive layer further comprises a phototransparent conductive coating layer on one or both sides of the phototransparent organic conductive film.

3. The touch panel of claim 1, wherein said contact conductive layer further comprises a protective film layer on said phototransparent organic conductive film.

4. The touch panel of any one of claims 1 to 3, wherein said contact conductive layer further comprises a hardcoating layer on the surface thereof.

5. The touch panel of claim 1, wherein said phototransparent organic conductive film is simply manufactured by the method that white powder of metal oxides consisting of indium oxide, antimony oxide, or tin oxide, etc are added to an ordinary polymer for the

formation of films to have the resistance value of 300 - 800 Ω/□ of the mixed polymer.

6. A touch panel substantially as described herein, with reference to the accompanying drawings.

The Patent Office

Application No:	GB 9607274.9	**Examiner:**	M. G. Clarke
Claims searched:	1-6 as amended	**Date of search:**	28 November 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G1N NAGB10, NAQB

Int Cl (Ed.6): G06K 11/12

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB2148011A	Toppan Moore Co - see especially pages 3,4	
A	GB2088063A	Robert Branton et al. - see especially page1 lines 67-126	
A	US3911215	assigned to Elographics Inc - whole document	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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